

RESEARCH PAPER ON EMISSION REDUCER

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Abstract: Reduction of vehicle emission by emission reducer using adsorption principle is a concept of reducing the emission from the vehicle (100cc motor bike) through the adsorption materials like bituminous coal based activated charcoal & potassium permanganate and water.

When the engine is started the exhaust gases from the combustion of fuel and air is send to the emission reducer through exhaust pipe, this exhaust pipe is connected to the activated charcoal chamber and then the perforated tube that is inside the emission reducer, where the perforated tube contains small holes on its surface.

As soon the gases enters inside the adsorbent chamber of the emission reducer it contains activated charcoal & potassium permanganate where the carbon particles are adsorbed further the gases enters the emission reducer chamber and react with water and where carbon monoxide, nitrogen oxide, sulphur dioxide and particulate matter are reduced by the adsorption action of water, this reduced gases are sent to atmosphere through the outlet pipe of emission reducer.

Key Words: Emission reducer, Adsorbent chamber, Activated charcoal, Potassium permanganate, perforated tube.

1. INTRODUCTION

The fuel based vehicles are more than 2 billion around globally which results in increasing of greenhouse gases and other toxic pollutants level in the atmosphere. Increase in green house gases leads to a positive climate change and it causes gradual increase in overall temperature of the earth's atmosphere which is known as global warming. Some toxic gases cause respiratory problems, mental illness and chronic lung disease. So due to this concern the emission reducer is used to reduce the toxic pollutants level from the vehicle exhaust gases through the adsorption principle.

1.1 WHAT IS EMISSION REDUCER

An emission reducer is a device which reduces the emission from the vehicle by adsorption principle

using carbon adsorbent materials like bituminous coal based activated charcoal, potassium permanganate and water.

2. COMPONENTS

2.1 Exhaust Pipe:



Fig.2.1 Exhaust pipe

Modifying the available silencer pipe with 1.5inch diameter and a length of 0.6meter, the material of the silencer pipe is stain less steel. Exhaust pipe is used to connect the engine and emission reducer through flange coupling and the carbon adsorbent chamber.

2.2 Carbon Adsorbent Chamber:

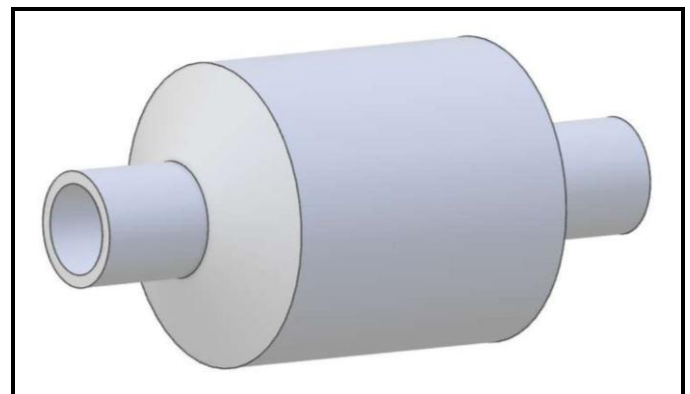


Fig 2.2 Carbon adsorbent sleeve

The chamber is completely filled with activated charcoal and potassium permanganate in pellets form which is closed by a mesh inside the chamber in order to prevent the movements of the pellets.

2.3 Flange Coupling:

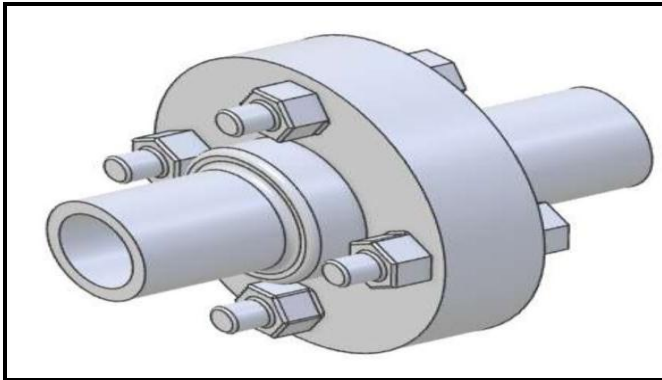


Fig 2.3 Flange coupling

The flange is used for connecting the emission reducer and the exhaust pipe.

2.4 Non Return Valve:

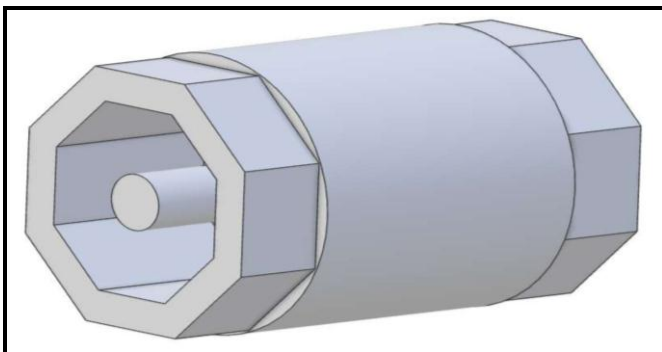


Fig2.4 Non return valve

The non return valve is placed between emission reducer and engine exhaust pipe to prevent back flow of gases.

2.5 Perforated Tube:

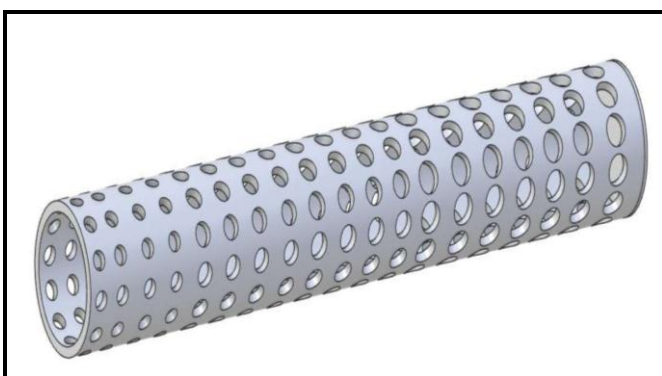


Fig 2.5 Perforated tube

A perforated tube is fitted inside the emission reducer chamber to convert huge mass bubbles into low mass bubbles at the outer surface holes.

2.6 Emission Reducer Chamber:

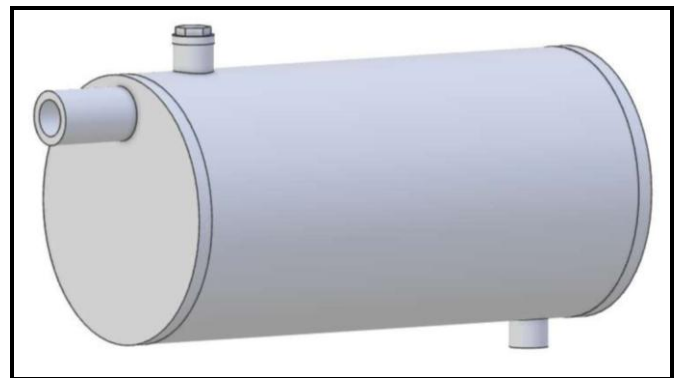


Fig 2.6 Emission reducer chamber

The chamber consists perforated tube welded at the centre with half filled water with holes for filler plug drain plug and exhaust.

3. CONSTRUCTION

An emission reducer consists of a perforated tube and water which is installed in the exhaust pipe of diameter 1.5 inch, the perforated tube consist holes of different diameters. Generally 4 sets of holes are drilled on the perforated tube. The other end of the tube is closed by plug. A small opening is provided at the top of the container to discard the exhaust gases and a drain plug is provided at the bottom of the container for repeatedly cleaning of the container. Also a filler plug is mounted at the top of the container. At the inlet of the exhaust pipe a non-return valve is arranged which prevents the back flow of gases.

4. WORKING

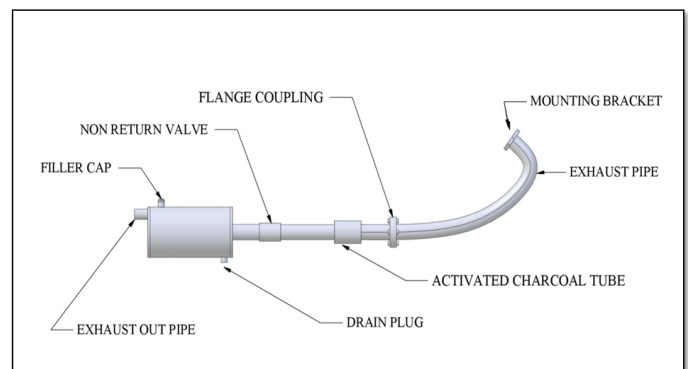


Fig 4.1 Emission reducer

At first the exhaust gases enter the carbon adsorbent chamber which is filled with potassium permanganate and activated charcoal placed near to the exhaust side of the engine where it adsorbs the carbon particles.

This layer is highly porous and possesses extra free valences so it has high absorption capacity.

After passing through the charcoal layer the exhaust gases enter in to the emission reducer through the one way check valve and are received through the perforated tube which converts high mass bubbles into low mass bubbles at the surface of the perforated tube, this gases enters into the water where the smoke particles get sticks to the water molecules which causes some reaction of emissions with water and some of the gases may dissolved into the water also noise level is damped inside the chamber and finally the exhaust gases liberate through the opening of the exhaust port and enters into the atmosphere. Hence the emission reducer reduces pollution.

5. PROCEDURE FOR MAINTANANCE OF EMISSION REDUCER FOR TWO WHEELER

- Step one- Park the bike on the centre stand on a flat area and make sure the silencer is not heated.
- Step two- Keep a pan under the emission reducer chamber near the drain plug.
- Step three- Remove the drain plug using spanner and leave it to drain completely for some time.
- Step four- remove the filler plug and pour some water until all the sludge water comes through the drain pipe.
- Step five- Tighten the drain plug with spanner.
- Step six- Fill two liters of water with twenty milliliters of lime water into the chamber through filler plug and tighten the filler plug.

6. DISPOSING OF THE SLUDGE WATER

The sludge water must be properly disposed because of pollutant particles containing in it. After removing the sludge water from the emission reducer, allow the sludge water to dry by exposing it to sun light. Due to sun light the sludge water gets dried and it is available in the powder form which is contaminated carbon particles. These carbon particles can be used for the manufacture of ink and paints.

7. PROBLEM IDENTIFIED

- Formation of sludge.
- Replacement of water over a period of time.
- When motorbike falls accidentally there may be chances of water to spill out.

8. RESULTS AND ANALYSIS

i. Test using simple silencer

The smoke from a single cylinder four stroke petrol engine is made to pass by company silencer.

Table 1: Test using simple silencer

Content No	Constituents	Amount
1	CO	13.00%
2	HC	+21220ppm
3	CO ₂	+17.00%
4	O ₂	+0.00%
5	NO ₂	580ppm

ii. Test using silencer with activated charcoal

Activated charcoal is used inside the silencer because of its excessive absorption capability. It adsorbs the carbon particles present in the exhaust gases and reduces into certain level.

Table 2: Test using silencer with activated charcoals

Content No	Constituents	Amount
1	CO	11.00%
2	HC	+20025ppm
3	CO ₂	+17.00%
4	O ₂	+0.00%
5	NO ₂	510ppm

iii. Test using lime water

In this test lime water is mixed with the water. This results in reducing of the quantity of nitrogen dioxide. As nitrogen dioxide is more poisonous than hydrocarbons, this test is taken into consideration as greater efficient.

Table 3: Test using lime water

Content No	Constituents	Amount
1	CO	9.00%
2	HC	+19580ppm
3	CO ₂	+17.00%
4	O ₂	+0.00%
5	NO ₂	460ppm

9. SCOPE FOR THE FUTURE

Emission reducer is efficient in reducing the some of the most important pollutants like Nitrogen oxide, carbon monoxide, particulate matter and volatile organic compounds etc. All the emission cannot be reduced, so in future work the scope of reducing all type of emission will be focused with cost effective materials.

CONCLUSION

In order to reduce the emissions level in the atmosphere from the gasoline vehicles the Emission reducer is needed. This system is used for two wheelers, three wheelers and four wheelers because at cold starting of this type of vehicles produces more black smoke especially four wheeler truck and lorry vehicles. It can also be used in industries in a larger scale of the emission reducer.

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